



# Validation Study of Image Segmentation Algorithms

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## Definitions

- Image Recognition: A subset of machine learning that classifies images
- Machine Learning: A subject in computer science with the goal of teaching computers to learn
- Image Segmentation: How a computer divides an image
- Algorithm: A mathematical formula, performed in a particular set of steps
- Python: A programming language
- Programming Libraries: Code that is available for a wide variety of purposes.

## Objectives

- Introduce machine learning and the research around image segmentation
- Increase familiarity with tools and fundamental concepts
- Emphasize projects related to current research trajectories for NASA, general robotics applications, and Southwest Research Institute
- Make sophisticated code available to fellow undergraduates

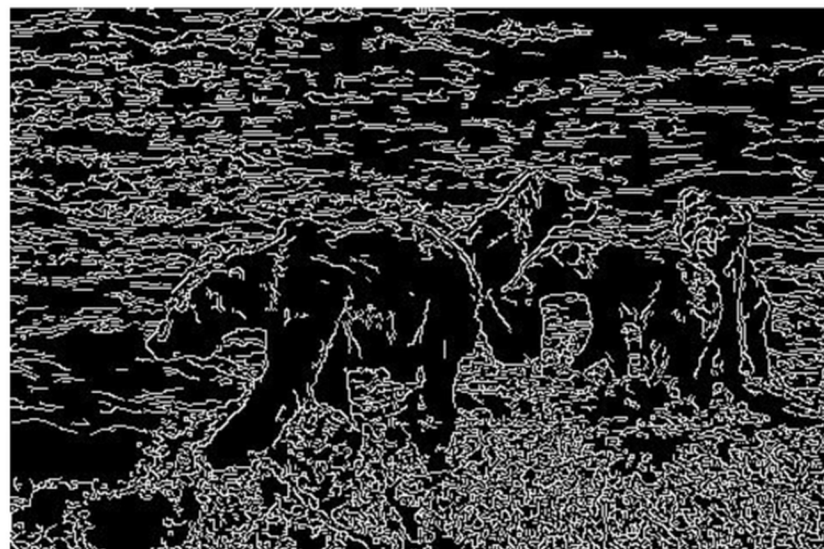
## Methods

- Selected articles that offered an approachable segmentation algorithm
- Studied three algorithms:
  - Sobel filter
  - Laplacian filter
  - Canny Edge Detector
- Implemented algorithms in Python, using a Jupyter Notebook
- Measured using scale of accuracy

## Project Effects

- Two main benefits:
  - Prepares researcher to find other avenues of research
  - Gives newer students in area resources

## Canny Edge Detector



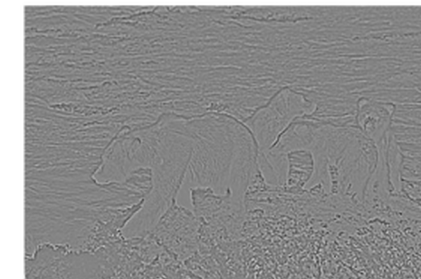
## Example Segmentations



Original Image



Sobel Filter



Laplacian Filter



Gaussian Filter

- Sobel: Estimates derivative at each location
- Laplacian: Estimates second derivative at each location
  - Both Sobel and Laplacian are especially susceptible to image noise
- Canny Edge: Applies a Gaussian Filter, then a Sobel Filter

## References

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